

# Shaped and Seamless Thermal Protection System

Completed Technology Project (2015 - 2016)



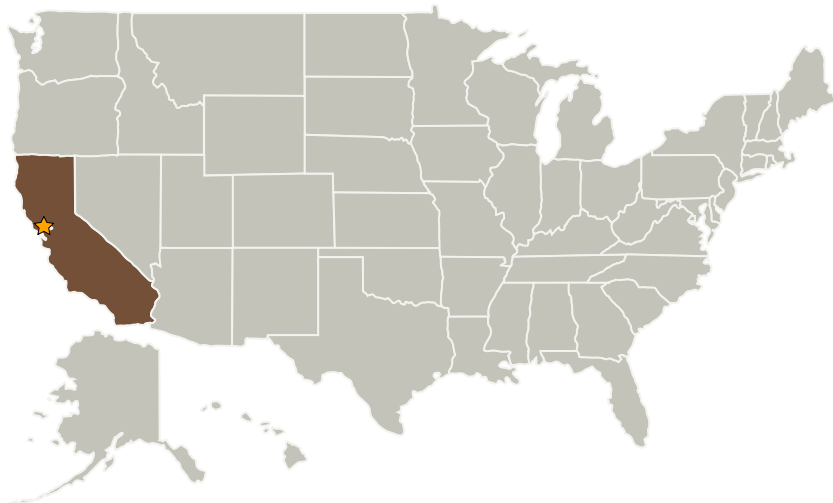
## Project Introduction

This proposal is to fabricate customized geometric shapes using knitting technology and infiltrating refractory fibers either in-situ or before attachment to the vehicle substructure. These materials will be flexible and exhibit smooth, form-fitting behavior. Using our experience in the design of TPS, we will identify and assess the knitted architectures (patterns) and material combinations that are the most suitable to TPS applications, and evaluate the advantages of those systems over conventional solutions. Refractory fibers/yarns are knitted into complex shapes which can be impregnated with phenolic/silicone additives before use in TPS or fitted onto an aeroshell part and infiltrated in-situ. Backshell TPS areas with complex shapes, seams and joints could be protected by a one-piece knitted TPS component that would conform to the substructure and eliminate most joints. Deliverables: Demonstrate fabrication of thick knitted parts; produce complex shaped samples; infiltrated knitted part suitable for arc-jet testing

## Anticipated Benefits

Replacing conventional heat shield components with gaps, seams, and other complex geometries.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

Center Innovation Fund: ARC CIF

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Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
HRL Laboratories, LLC	Supporting Organization	Industry	Malibu, California

## Primary U.S. Work Locations

California

## Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

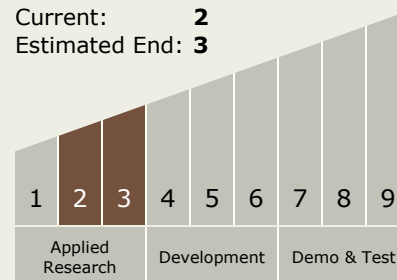
Harry Partridge

**Principal Investigator:**

Thomas H Squire

## Technology Maturity (TRL)

Start: 2  
 Current: 2  
 Estimated End: 3



## Technology Areas

**Primary:**

- TX14 Thermal Management Systems
  - └ TX14.3 Thermal Protection Components and Systems
    - └ TX14.3.2 Thermal Protection Systems